

## Field: EMERGENCY PREPAREDNESS AND RESPONSE

# Topic: FUNDAMENTAL CONCEPTS OF NUCLEAR AND RADIOLOGICAL EMERGENCY PREPAREDNESS AND RESPONSE (EPR)

**Course type:** TRAINING

**Format:** Massive Open Online Course (MOOC)

**Duration:** 4 × half days  
*Working through the course at own pace*

**Working language of the course:** English

### **Objectives and learning outcomes**

Participants will be introduced to the fundamental physical and engineering concepts needed to understand the objectives, the working methods, and the procedures of nuclear and radiological emergency preparedness and response. These concepts will be further elaborated and expanded in regular, more advanced courses on emergency preparedness and response.

### **Outline of course content**

- Lectures will introduce the fundamental concepts needed to understand Nuclear and Radiological Emergency Preparedness and Response.
- Introduction to radioactivity and radioisotopes, and interaction of ionizing radiation with matter, as the basis for the concepts of radiation doses. Fundamentals of Radiation Protection, including the types of radiation doses, their units, and the concept of ALARA.
- Introductory concepts and phenomena related to severe accidents at nuclear power plants as potential source of radioactivity released to the environment: definitions, concepts of safety barriers, Emergency Preparedness and Response as last level of Defence-in-Depth. The INES scale of severe accidents. Examples of non-NPP radiological emergencies.
- Exposure pathways and radiological consequences: deterministic and stochastic effects, dose coefficients, dose limits and reference levels.
- Fundamentals of environmental monitoring for emergencies, real-time measurement devices and measurement networks.
- Introduction to emergency response planning, response strategies, emergency planning zones around nuclear power plants.
- Simulation tools for emergency preparedness and for emergency response. Comparison of fast-running versus best-estimate codes to evaluate accident Source Terms and radiological consequences. Examples of most widely used codes for both needs.
- Introduction to the most important severe accidents: Chernobyl and Fukushima. Background, causes, countermeasures, Source Terms, radiological impact, environmental impact, remediation activities. Differences between the two cases in both initiating events and reaction of decision-makers on mitigation and response.

### **Technical schedule and delivery methods**

The course will be organized as a MOOC with 12 theoretical lectures (pre-recorded video presentations) continuously accessible, regular consultation sessions and opportunity to ask questions.

The course will take about 4 × half days but participants can work through the course materials at their own pace.

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### **Target audience**

This course is intended for young professionals aiming at understanding the main concepts needed to deal with more advanced topics in nuclear and radiological emergency preparedness and response. Employees of Nuclear Regulatory Authorities (NRAs) and Technical Support Organizations (TSOs), preferably with responsibilities related to emergency preparedness or wishing to interact consciously and effectively with experts in this area, with little initial technical knowledge and skills but with potential for future direct involvement, are the ideal target audience.

The fundamentals acquired here will be applicable not only in everyday work but the course, as an introductory methodological approach, will create a shared and common background and ensure that adequate knowledge is available to comprehend the regular, more advanced courses on emergency preparedness and response.

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### **Prerequisites and requirements for participants**

As this is a foundation course, no specific technical knowledge or preparation is required but participants should have an adequate level of knowledge in English.

Participants need to have possibility to attend pre-recorded video lessons via the Internet.

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### **Terms of participation**

The project is implemented under the European Union (EU) external assistance programme, called the European Instrument for International Nuclear Safety Cooperation (INSC), and aims to support the National Nuclear Regulatory Authorities (NRAs) and their Technical Support Organisations (TSOs) in non-EU countries in strengthening their capabilities with regard to their regulatory tasks and responsibilities in the field of nuclear safety and radiation protection.

Employees of the NRAs or their TSOs in the Beneficiary Countries are eligible for financially supported participation in the T&T courses. Beneficiary Countries of the project are published on the website <https://training.ek-cer.hu/>.

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### **Costs**

Participation and access to the course materials is free, but registration is required.

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### **Application**

Application via the website <https://training.ek-cer.hu/>, according to the process there, enrolment in the course following appropriate registration.

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### **Examination**

Acquired knowledge of the participants will be assessed through a technical test at the end of the course, which full course completion and successful test can be a prerequisite for attending the regular, more advanced courses on emergency preparedness and response. Participants attending the full course will be issued with attendance certificates.

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